Perry Creek, Washington, a Fern-watcher's Eldorado

A. R. KRUCKEBERG*,[1]

The vascular plant flora in the major drainage systems of western Washington is highly predictable from one river valley to the next. The typical coniferous forest plants reoccur throughout the region. This expectation holds as well for the ferns and fern-allies in the cismontane Pacific Northwest. The same species, Bracken (*Pteridium aquilinum* var. *pubescens*), Sword Fern (*Polystichum munitum*), Lady Fern (*Athyrium filix-femina*), Oak Fern (*Gymnocarpium dryopteris*), and Deer Fern (*Blechnum spicant*), can be expected in the usual range of forest communities. But the botanist-naturalist is in for a big surprise along a two-mile segment of the Perry Creek trail in Snohomish County, Washington, about 40 miles northwest of Seattle. No fewer than 26 species of ferns and fern-allies are known from this remarkable locality. It is a truly exceptional habitat well within the lowland coniferous forest biome.

The first detailed collecting in Perry Creek was that of Mr. John W. Thompson in the 1930's. Thompson, then a high school biology teacher in Seattle, had a keen eye for the unusual. His collections of Pacific Northwest plants turned up many a novelty. A complete set of his collections was acquired by the University of Washington Herbarium, where Thompson served as assistant curator from 1943 to 1960.

Following Thompson's discovery of the diverse ferns of Perry Creek, the locality has been visited frequently by botanists and amateur naturalists. In 1963, Dr. Warren H. Wagner, Jr. visited Perry Creek in the company of the author. Wagner's interest in the locality was whetted by the earlier Thompson finds—seven species of *Botrychium* and the sympatric occurrence of three *Polystichum* species. It was on this foray that Wagner found the hybrid between *P. andersonii* and *P. munitum* (Wagner, 1973). The richness of the Perry Creek fern flora was revealed to other pteridologists in 1969. A trip to the area, led by Drs. Wagner and T. M. C. Taylor, was made during the 12th International Botanical Congress, held that year in Seattle. Members of the foray were able to verify the occurrence of many pteridophytes that Thompson had first found.

PERRY CREEK FERNS

The following paragraphs list the pteridophytes that occur along the first two miles of the Perry Creek Trail. This listing is compiled from observations and herbarium records (WTU) made over the years. The most recent corroboration of this list was made on September 11, 1975 by members of the Fern Study Group of the Northwest Ornamental Horticultural Society and the author.

Although most of species listed are frequent to common in western Washington, it is exceptional to find them so closely associated in a single, rather small natural area. The occurrence of *Polystichum andersonii*, its hybrid with *P. munitum*, *P.*

*Department of Botany, University of Washington, Seattle, WA 98195.

[1]I am indebted to W. H. Wagner, Jr. and T. M. C. Taylor for their valued counsel over the years on the ferns of Perry Creek. Two members of the Fern Study Group (Northwest Ornamental Horticultural Society), Mareen S. Kruckeberg and Sue Olsen, have been helpful in the field surveys. Thanks are due David Wagner for data from this recent forays in the area.

lonchitis, Asplenium trichomanes, Dryopteris filix-mas, Cryptogramma crispa, three *Lycopodium* species, and seven *Botrychium* species are of special interest.

Adiantum pedatum L. is frequent and often gregarious on lush, shady talus under hardwoods.

Asplenium trichomanes L., so common along the Perry Creek Trail on wet talus mostly under hardwoods, is infrequent and local elsewhere. At Perry Creek it is nearly as abundant as *Cryptogramma crispa,* a fern found everywhere on the more open but moist talus.

Athyrium filix-femina (L.) Roth is very common throughout the area; in forb-rich talus habitats it is the dominant forb.

Blechnum spicant (L.) J. Smith is restricted to regenerating, clear-cut Hemlock-Fir forest near the trail head and is rare on wet talus.

Botrychium boreale Milde, *B. dusenii* (Christ) Alston, *B. lanceolatum* (Gmel.) Ångst., *B. lunaria* var. *onondagense* (Underw.) House, *B. multifidum* (Gmel.) Trev., *B. simplex* E. Hitchc., and *B. virginianum* (L.) Swartz are all infrequent on wet, mossy talus in hardwood glades. None is at all common, although *B. multifidum* is not infrequently encountered from the coast of Washington up to mid-montane altitudes. Some years it has not been possible to locate the other species, even after intensive searches above and below the trail. It was considered the high point of the 1969 pre-Congress foray for the party to have rediscovered all of the Grape Fern species located many years before by Thompson.

Cryptogramma crispa (L.) R. Br. is common on wet talus, with or without hardwood cover. The plants are unusually large and lush, and well below their usual lower altitudinal limit. In the Cascade and Olympic Mountains, *C. crispa* normally occurs on subalpine talus and rock outcrops.

Cystopteris fragilis (L.) Bernh. is rare under the cover of hardwoods on talus.

Dryopteris filix-mas (L.) Schott is another fern of sporadic and infrequent occurrence in the west (Reisender, 1974), and is not common at Perry Creek, having been collected by Mickel in 1969 and Denton in 1974. It was from a plant collected at Perry Creek (Snohomish, not Chelan County) that Reisender obtained the first chromosome count ($2n=82$, tetraploid) of any western member of the complex.

Dryopteris assimilis S. Walker (=*D. austriaca* (Jacq.) Woynar) is infrequent, mostly in coniferous woods.

Gymnocarpium dryopteris (L.) Newm. is occasional but gregarious in coniferous woods and under hardwoods on talus.

Lycopodium clavatum L. is infrequent in regenerating, clear-cut forests, with Deer Fern. *Lycopodium miyoshianum* Makino is present at Perry Creek, according to Mr. Joseph Beitel (pers. comm.). It occurs on wet, moss-covered talus in the shade of Vine Maples. *Lycopodium selago* subsp. *patens* (Beauv.) Calder & Taylor, although frequent at Perry Creek in habitats like those of *L. miyoshianum,* seldom makes more than a sporadic appearance in the Pacific Silver Fir zone elsewhere in our area.

Polypodium glycyrrhiza D. C. Eaton occurs mostly on trunks and limbs of Maples. *Polypodium hesperium* Maxon (or possibly *P. montense* Lang) grows on rocks in crevices, and is infrequent.

Polystichum andersonii Hopkins is frequent under hardwoods on moist talus slopes. It is sporadic and infrequent in the Pacific Northwest; its few localities are widely separated throughout its range from northwestern Oregon to southeastern Alaska and east to Montana. The hybrid of *P. andersonii* with *P. munitum* is sporadic and rare, and usually occurs with both parents. It has been found on Mt. Hood, Oregon, and on Mt. Rainier, Washington, according to David Wagner (pers. comm.). *Polystichum lonchitis* (L.) Roth typically is a fern of high, wooded to open talus in the fringes of the subalpine forest, the Mountain Hemlock Zone of Franklin and Dyrness (1973). The Perry Creek station is certainly the lowest in elevation for this fern in Washington. It is intermittent mostly under hardwoods on talus, but also occurs on open talus slopes. Obvious hybrids involving *P. lonchitis* with *P. munitum* or *P. andersonii* have not been discovered, despite attempts to find them. *Polystichum munitum* (Kaulf.) Presl is locally abundant, elsewhere frequent, mostly in the shade of hardwoods or conifers.

Pteridium aquilinum var. *latiusculum* (Desv.) Underw. is locally abundant, mostly along the Perry Creek trail.

Selaginella wallacei Hieron. is frequent on moss-covered talus boulders, mostly in the open.

VEGETATION OF THE PERRY CREEK AREA

The Perry Creek fern habitat is a most exceptional enclave within the broadly distributed lowland coniferous forest biome (Western Hemlock or *Tsuga heterophylla* Zone of Franklin and Dyrness, 1973) in western Washington. One needs only to traverse similar tributary canyons of the major river systems of the Puget Sound basin to discovery why. Whereas most such drainages are uniformly clothed with a mixed coniferous forest of Douglas Fir, Western Hemlock, and Western Red Cedar, with associated typical understory species, the fernery of Perry Creek is located along a succession of hardwood glades, patches of exceptional assemblages of conifers of smaller than usual stature, and open talus, all on steep, moist slopes. The hardwoods are chiefly maples: *Acer macrophyllum* of low and sparse profile, along with thickets of the shrubby *A. circinatum* and *A. glabrum*. The Maple thickets frequently are replaced by similarly dense stands of deciduous, shrubby *Cornus stolonifera* or pure forb communities dominated by *Athyrium filix-femina* and *Rubus parviflorus*.

Hardwood thickets are the dominant community on wet talus, and contain no conifers. The seed plants and associated ferns are: *Acer circinatum, A. glabrum, *Actaea arguta, Alnus rubra, Aruncus sylvester, Athyrium filix-femina, Carex mertensii, Cornus stolonifera, *Elymus glaucus, Epilobium angustifolium, Geum macrophyllum, Oplopanax horridum, Osmorhiza occidentalis, Pteridium aquilinum* var. *latiusculum, Ribes petiolare, Rubus parviflorus, R. spectabilis, Sambucus racemosa, Sorbus sitchensis, Thalictrum occidentale, *Tolmiea menziesii, Valeriana sitchensis,* and *Veratrum viride*. The species with asterisks apparently are restricted to trailside. It is in the understory of these hardwood glades that most of the Perry Creek ferns occur, although several species extend beyond onto the massive bouldery talus tracks between the hardwood glades.

On slightly less precipitous slopes, one finds open, coniferous woods, but not of the same composition as those of the climax coniferous forests on adjacent slopes. Rather, Alaska Cedar (*Chamaecyparis nootkatensis*), Subalpine Fir (*Abies lasiocarpa*), Douglas Fir (*Pseudotsuga menziesii*), and Western Hemlock (*Tsuga heterophylla*), all of smaller than expected stature, occur interspersed with the same hardwood dominants mentioned above.

Open, bouldery talus has a rich cover of mosses and lichens. The frequent ferns are: *Cryptogramma crispa, Asplenium trichomanes, Lycopodium selago* subsp. *patens*, and *Selaginella wallacei*. Very few angiosperms occur, among them *Montia flagellaris, Saxifraga bronchialis*, and *S. ferruginea*.

Wooded, bouldery talus replaces hardwood thickets or open talus on gentler slopes, and yet has the same rocky nature. This habitat is dominated by Alaska Cedar, although *Acer macrophyllum* also is common. Douglas Fir and Pacific Silver Fir (*Abies amabilis*) are occasional. Thick carpets of moss occur on the shaded talus, commonly with *Asplenium trichomanes, Cryptogramma crispa, Goodyera oblongifolia, Montia flagellaris*, and *Polystichum munitum*.

Nearly everywhere along the two-mile sector of the trail the substrate is rocky, ranging from gravelly textured scree to massive, jagged boulders arranged in long, steep talus slopes. Although the soil is shallow to non-existent, the rock is mantled with a luxuriant coat of mosses and lichens. This non-vascular mat serves as a substrate for the ferns, fern-allies, grasses, forbs, and even for some of the woody plants. In sum, we find a microcosm of wet, rocky talus surrounded by the climatically dominant coniferous forest; the former must be an enclave caused by a unique combination of environmental factors.

In the absence of carefully instrumented monitoring of the habitat, some of the operational factors may be inferred by observing the topography and the biological indicators of the area.

Perry Creek is a tributary of the south fork of the Stillaguamish River in central Snohomish County, western Washington (*Fig. 1*). It is well within the lower to mid-montane transition zone along the western flanks of the Cascade Range. The terrain along this sector of the Stillaguamish drainage is one of spectacularly sheer and high peaks rising abruptly out of the valley floor, which lies at ca. 1700 feet altitude. Perry Creek itself is in a narrow, steep-sided canyon bounded on the east and west by two dominating peaks, Mount Dickerman (5266 feet) and Stillaguamish Peak (5863 feet). Downstream from Perry Creek, just beyond its junction with the Stillaguamish River, is the massive, sheer wall of Big Four Mountain (6120 feet), which has on its north-facing slope permanent snowfields and at its talus base low-lying snowfields that are sculpted into the well known Ice Caves near Big Four. At the Ice Caves, the local environment and flora are truly subalpine, despite the altitude of only 1800 feet.

Given the frigid shelter of towering mountain walls on all sides, the occurrence of a truncated and telescoped sequence of "life-zones" is not unexpected. Under the usual conditions of gradual increase in elevation, the shift from the Western Hemlock through the Pacific Silver Fir to Mountain Hemlock Zone, with their attendant plant communities, would be gradual and not perceptible over short

distances. But at Perry Creek and at other sites along the Stillaguamish River, abrupt topographic and associated local climatic changes cause similarly abrupt changes in the floristic assemblages. But this inference from topography and climate alone does not wholly explain the hardwood scrub and talus communities within the foreshortened zonation of coniferous forest life-zones. I believe it is a matter of two integrated physical factors. First is the local climate, which provides a cool, moist habitat, shaded for much of the day. Second is the unstable, boulderly talus. Both climate and substrate provide niches for ferns and other plants from diverse communities. Further, the talus of the hardwood glades that contain the bulk of the fern species is rich with mosses, which provide an optimally moist substrate for ferns throughout their life-cycles.

FIG. 1. Looking down Perry Creek to the canyon of the south fork of the Stillaguamish River and Big Four Mountain on the horizon. Photo courtesy Mr. J. W. Thompson.

The nearest weather station to Perry Creek is at Silverton (1500 feet), about 5 miles west and downstream in the same river valley. From weather records (*Table 1*) it is easy to see that winter temperatures decrease and precipitation increases across the altitudinal transect from Puget Sound to the lower montane elevation of the Stillaguamish River. Undoubtedly, winter temperatures are still lower and precipitation greater along Perry Creek.

The Washington State geological map (Huntting, 1961) portrays the rocks in the region of Perry Creek as pre-Jurassic sediments. It has not been possible to identify the particular sedimentary rocks along the crucial stretch of wet talus that

supports the ferns. The entire formation is complex, and according to Huntting (1961), consists of "graywacke, argillite and siltstone with some slate and phyllite; [it] includes graywacke breccia and ribbon chert with minor local limestone lenses and basalt flows."

The entire drainage of the south fork Stillaguamish River is exceedingly rich floristically and includes other fern species besides those that cluster along the Perry Creek talus. From herbarium records and observations by the author, the following ten pteridophytes can be added to the Perry Creek list. Three species characteristic of ultramafic (high magnesium) rocks occur in the nearby upper Coal Creek drainage: *Aspidotis densa* (Brack. in Wilkes) Lellinger, *Adiantum pedatum* subsp. *aleuticum* (Rupr.) Calder & Taylor, and *Polystichum mohrioides* var. *lemmonii* (Underw.) Fern. (Kruckeberg 1969, p. 84). David Wagner (pers. comm.) confirms the presence of *Polystichum kruckebergii* Wagner along with *P. mohrioides* var. *lemmonii* on Devil's Thumb, also in the upper Coal Creek drain-

TABLE 1. CLIMATIC DATA FOR PORTIONS OF SNOHOMISH COUNTY, WASHINGTON[1]

Station and altitude	*Distance* (mi) *from Perry Creek*	*Temperatures* (°F) *Jan. average*	*July average*	*July max.*	*July min.*	*Precipitation* (in) *Annual average*
Everett, 100 ft	40	38.0	61.2	99	3	32.74
Granite, Falls 391 ft	20	—	—	—	—	59.41
Silverton, 1500 ft	5	33.0	61.2	103	0	94.80

[1]Data from U.S. Dept. of Agriculture (1941, p. 1173).

age, as reported first by Slater (1967). D. Wagner also found *Lycopodium sitchense* Rupr. in the same area. *Athyrium distentifolium* is a common talus species in the subalpine sections of the drainage; it is also at the Ice Caves. Other ferns and fern-allies known to occur in the Perry Creek drainage basin are *Asplenium viride* Huds. (Mt. Dickerman), *Thelypteris limbosperma* (All.) H. P. Fuchs (Monte Cristo), *T. phegopteris* (L.) Slossen (Big Four Mtn.), and *Woodsia scopulina* D. C. Eaton (Mt. Dickerman). Expected, but not yet found, in the Stillaguamish River drainage are *Cheilanthes gracillima* D. C. Eaton, *Cryptogramma stelleri* (Gmel.) Prantl, *Dryopteris arguta* (Kaulf.) Watt, *Pityrogramma triangularis* (Kaulf.) Maxon, *Selaginella oregana* D. C. Eaton in Wats., and *Equisetum* spp.

The Perry Creek fernery is within the jurisdiction of the U.S. Forest Service (Monte Cristo Ranger District, Snoqualmie-Mt. Baker National Forest). Although there seems to be no immediate danger to the habitat, it is conceivable that mining or logging operations in other parts of the Perry Creek drainage could pose a threat. When I first visited the site in the early 1950s, our party hiked in from the bottom of the river valley through a virgin Hemlock-Cedar-Douglas Fir forest before reaching the fern-hardwood talus. The lower coniferous forest was logged in the late 1950's to within ¼ mile of the critical fern habitat. It is to be hoped that

the Forest Service will take steps to preserve the Perry Creek fern area in perpetuity, either as a Botanical Area or as a Research Natural Area. At present the trail through the site is a tolerable and handy intrusion, but no further modification of this priceless botanical and scenic habitat should occur.

LITERATURE CITED

U.S. DEPT. OF AGRICULTURE. 1941. Climate and Man. Yearbook of Agriculture.

FRANKLIN, J. F. and C. T. DYRNESS. 1973. Natural Vegetation of Oregon and Washington. U.S.D.A. Forest Service Gen. Tech. Rept. PNW-8.

HUNTTING, M. T., et al. 1961. Geological map of Washington. State Dept. of Mines and Geology, Olympia, Wash.

KRUCKEBERG, A. R. 1969. Plant life on serpentinite and other ferro-magnesian rocks in northwestern North America. Syesis **2:** 15-114.

REISENDER, E. A. 1974. Chromosomes of the Male Fern from the western United States. Amer. Fern J. **64:** 81-82.

SLATER, J. R. 1967. More on fern distribution in Washington state. Occ. Pap. Dept. Biology, Univ. Puget Sound **32:** 293-310.

WAGNER, W. H., Jr. 1973. Reticulation of holly ferns (Polystichum) in the western United States and adjacent Canada. Amer. Fern J. **63:** 99-115.